nearest office of your State employment service or State apprenticeship agency. This information is also available from:

☛ The Home Builders Institute, National Association of Home Builders, 1201 15th St. NW., Washington, DC 20005.

For general information about the work of plumbers, pipefitters, and sprinklerfitters, contact:

☛ National Association of Plumbing-Heating-Cooling Contractors, 180 S. Washington St., P.O. Box 6808, Falls Church, VA 22040.

☛ Associated Builders and Contractors, 1300 North 17th St., Rosslyn, VA 22209.

☛ National Fire Sprinkler Association, Robin Hill Corporate Park, Rt. 22, Box 1000, Patterson, NY 12563.

☛ American Fire Sprinkler Association, Inc., 12959 Jupiter Rd., Suite 142, Dallas, TX 75238-3200.

☛ Mechanical Contractors Association of America, 1385 Piccard Dr., Rockville, MD 20850.

Roofers

(O*NET 87808)

Significant Points

- Jobs for roofers should be plentiful through the year 2008, because roofing work is hot, strenuous, and dirty, making job turnover high.
- Demand for roofers is less susceptible to downturns in the economy than some of the other construction trades because the majority of roofing work is repair and reroofing.
- Roofing has the highest accident rate of all construction occupations.

Nature of the Work

A leaky roof can damage ceilings, walls, and furnishings. To protect buildings and their contents from water damage, roofers repair and install roofs made of tar or asphalt and gravel; rubber or thermoplastic; metal; or shingles made of asphalt, slate, fiberglass, wood, tile, or other material. Repair and reroofing—replacing old roofs on existing buildings—provide many job opportunities for these workers. Roofers also may waterproof foundation walls and floors.

There are two types of roofs, flat and pitched (sloped). Most commercial, industrial, and apartment buildings have flat or slightly sloping roofs. Most houses have pitched roofs. Some roofers work on both types; others specialize.

Roofers work outdoors in all types of weather.

Most flat roofs are covered with several layers of materials. Roofers first put a layer of insulation on the roof deck. Over the insulation, they then spread a coat of molten bitumen, a tar-like substance. Next, they install partially overlapping layers of roofing felt—a fabric saturated in bitumen—over the insulation surface. Roofers use a mop to spread hot bitumen over the surface and under the next layer. This seals the seams and makes the surface watertight. Roofers repeat these steps to build up the desired number of layers, called "plies." The top layer is either glazed to make a smooth finish or has gravel embedded in the hot bitumen for a rough surface.

An increasing number of flat roofs are covered with a single-ply membrane of waterproof rubber or thermoplastic compounds. Roofers roll these sheets over the roof's insulation and seal the seams. Adhesive, mechanical fasteners, or stone ballasts hold the sheets in place. The building must be of sufficient strength to hold the ballast.

Most residential roofs are covered with shingles. To apply shingles, roofers first lay, cut, and tack 3-foot strips of roofing felt lengthwise over the entire roof. Then, starting from the bottom edge, they nail overlapping rows of shingles to the roof. Workers measure and cut the felt and shingles to fit intersecting roofs and to fit around vent pipes and chimneys. Wherever two roof surfaces intersect or shingles reach a vent pipe or chimney, roofers cement or nail flashing-strips of metal or shingle over the joints to make them watertight. Finally, roofers cover exposed nailheads with roofing cement or caulking to prevent water leakage.

Some roofers also waterproof and dampproof masonry and concrete walls and floors. To prepare surfaces for waterproofing, they hammer and chisel away rough spots or remove them with a rubbing brick before applying a coat of liquid waterproofing compound. They may also paint or spray surfaces with a waterproofing material or attach waterproofing membrane to surfaces. When dampproofing, they usually spray a bitumen-based coating on interior or exterior surfaces.

Working Conditions

Roofing work is strenuous. It involves heavy lifting, as well as climbing, bending, and kneeling. Roofers work outdoors in all types of weather, particularly when making repairs. These workers risk injuries from slips or falls from scaffolds, ladders, or roofs or from burns from hot bitumen. In addition, roofs become extremely hot during the summer. In fact, of all construction industries, the roofing industry has the highest accident rate.

Employment

Roofers held about 158,000 jobs in 1998. Almost all wage and salary roofers worked for roofing contractors. About 1 out of every 3 roofers was self-employed. Many self-employed roofers specialize in residential work.

Training, Other Qualifications, and Advancement

Most roofers acquire their skills informally by working as helpers for experienced roofers. They start by carrying equipment and material and erecting scaffolds and hoists. Within 2 or 3 months, trainees are taught to measure, cut, and fit roofing materials, and later, to lay asphalt or fiberglass shingles. Because some roofing materials are used infrequently, it can take several years to get experience working on all the various types of roofing applications.

Some roofers train through 3-year apprenticeship programs administered by local union-management committees representing roofing contractors and locals of the United Union of Roofers, Waterproofers, and Allied Workers. The apprenticeship program generally consists of a minimum of 2,000 hours of on-the-job training annually, plus 144 hours of classroom instruction a year in subjects such as tools and their use, arithmetic, and safety. On-the-job training for apprentices is similar to that for helpers, except the

apprenticeship program is more structured. Apprentices also learn to dampproof and waterproof walls.

Good physical condition and good balance are essential for roofers. A high school education or its equivalent is helpful, as are courses in mechanical drawing and basic mathematics. Most apprentices are at least 18 years old.

Roofers may advance to supervisor or estimator for a roofing contractor, or become contractors themselves.

Job Outlook

Jobs for roofers should be plentiful through the year 2008, primarily because of the need to replace workers who transfer to other occupations or leave the labor force. Turnover is high—roofing work is hot, strenuous, and dirty, and a significant number of workers treat roofing as a temporary job until something better comes along. Some roofers leave the occupation to go into other construction trades.

Employment of roofers is expected to grow about as fast as the average for all occupations through the year 2008. Roofs deteriorate faster than most other parts of buildings and periodically need to be repaired or replaced. About 75 percent of roofing work is repair and reroofing, a higher proportion than in most other construction work. As a result, demand for roofers is less susceptible to downturns in the economy than some of the other construction trades. In addition to repair and reroofing work on the growing stock of buildings, new construction of industrial, commercial, and residential buildings will add to the demand for roofers. However, many innovations and advances in materials, techniques, and tools have made roofers more productive than before and will restrict the growth of employment—at least to some extent. Jobs should be easiest to find during spring and summer, when most roofing is done.

Earnings

In 1998, median hourly earnings of roofers were $12.18. The middle 50 percent earned between $9.72 and $16.47. The lowest 10 percent earned less than $7.56 and the highest 10 percent earned more than $21.77.

Some roofers are members of the United Union of Roofers, Waterproofers & Allied Workers. According to the limited information available, average hourly earnings—including benefits—for roofers who belonged to a union and worked full time, ranged between $15.30 and $41.20 in 1998. Roofers in New York, Boston, San Francisco, Chicago, Los Angeles, Philadelphia, and other large cities received the highest wages.

Apprentices usually start at about 40 percent of the rate paid to experienced roofers and receive periodic raises as they acquire the skills of the trade. Earnings for roofers are reduced on occasion because poor weather often limits the time they can work.

Related Occupations

Roofers use shingles, bitumen and gravel, single-ply plastic or rubber sheets, or other materials to waterproof building surfaces. Workers in other occupations who cover surfaces with special materials for protection and decoration include carpenters, cement masons, concrete finishers, drywall installers and finishers, floor covering installers, plasterers and stucco masons, terrazzo workers, and tilesetters.

Sources of Additional Information

For information about roofing apprenticeships or job opportunities in this trade, contact local roofing contractors; a local chapter of the roofers union; a local joint union-management apprenticeship committee; or the nearest office of your State employment service or State apprenticeship agency.

For information about the work of roofers, contact:

☛ National Roofing Contractors Association, 10255 W. Higgins Rd., Rosemont, IL 60018-5607

☛ United Union of Roofers, Waterproofers and Allied Workers, 1660 L St. NW., Suite 800, Washington, DC 20036.

Sheet Metal Workers and Duct Installers

(O*NET 89132)

Significant Points

- Job prospects should be good for persons who complete apprenticeship programs.
- Sheet metal work tends to be steadier than some other construction crafts, because maintenance and replacement work in existing buildings can compensate for slack in new construction.
- Unlike most construction craft occupations, few sheet metal workers and duct installers are self-employed.

Nature of the Work

Sheet metal workers and duct installers make, install, and maintain air-conditioning, heating, ventilation, and pollution control duct systems; roofs; siding; rain gutters; downspouts; skylights; restaurant equipment; outdoor signs; and many other building parts and products made from metal sheets. They may also work with fiberglass and plastic materials. Although some workers specialize in fabrication, installation, or maintenance, most do all three jobs. (Workers employed in the mass production of sheet metal products in manufacturing are not included in this statement.)

Sheet metal workers usually fabricate their products at a shop away from the construction site. They first study plans and specifications to determine the kind and quantity of materials they will need. They then measure, cut, bend, shape, and fasten pieces of sheet metal to make duct work, counter tops, and other custom products. In an increasing number of shops, sheet metal workers use computerized metalworking equipment. This enables them to experiment with different layouts and to select the one that results in the least waste of material. They cut or form parts with computer-controlled saws, lasers, shears, and presses.

In shops without computerized equipment, and for products that cannot be made on such equipment, sheet metal workers use hand calculators to make the required calculations and use tapes, rulers, and other measuring devices for layout work. They then cut or stamp the parts on machine tools.

Before assembling pieces, sheet metal workers check each part for accuracy and, if necessary, finish it by using hand, rotary, or squaring

Sheet-metal workers usually fabricate their products at a shop away from the construction site.